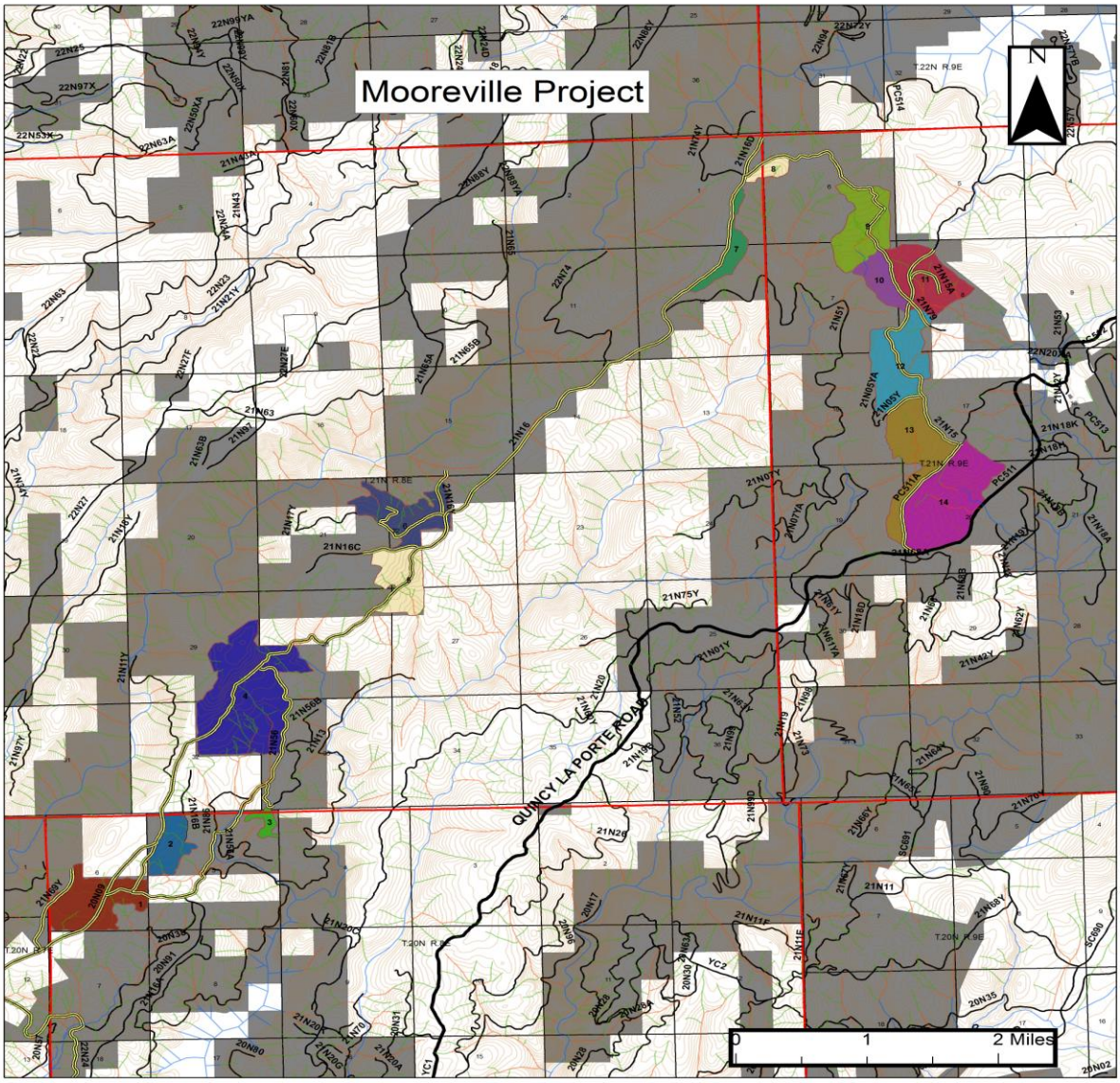
Mooreville Thinning Project

Silvicultural Prescriptions and Marking Guidelines



Prepared by: /S/ Jose Rodriguez Date: 3/13/20

Jose Rodriguez, Forester
Feather River Ranger District
Plumas National Forest

Reviewed by: /S/ Eric Murphy Date: 3/17/20

Eric Murphy, Supervisory Forester
Plumas National Forest

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1) VARIABLE DENSITY THINNING (IN SPECIFIED UNITS)

UNITS: 1, 2, 3, 7, 8, 9, 14

OBJECTIVES AND DESIRED CONDITIONS

1. Reduce the risk of insect and disease-caused tree mortality through mechanical thinning;
2. White fir will be removed in favor of retaining other tree species;
3. Promote shade intolerant conifers and oak species;
4. Improved health of retained trees;
5. Surface fuels able to carry no more than 4 feet flame length surface fires (90th percentile weather conditions); fuel loading of fuels less than 3 inch diameter not exceeding 5 tons per acre.
6. Surface and ladder fuels removed to meet less than 20 percent mortality in dominant and codominant trees under 90^{th} percentile weather and fire behavior conditions.
7. Canopy base heights are greater than 15 feet. Maintain or increase within and between stand variability;
8. Relatively irregular tree spacing, crown density and species mixtures to promote landscape diversity.
9. Maintain trees and snags with wildlife characteristics unless near roadways.
10. Develop older forest conditions by releasing trees capable of large diameter growth.

AREA OF TREATMENT WITHIN UNIT

Thinning will occur throughout the area delineated on the map.

PRESCRIPTION #1

Stand-wide

1. Focus on what is being left rather than what is being taken when making tree selections. Take what is needed to move stand toward the desired conditions and maintain resilient conditions to the next entry (presumably at least 20 years). Residual basal area after treatment should average 100 and 200 square feet per acre with a range of low and high density areas making up that average based on existing conditions and location. Basal area targets should be achieved using a clumpy distribution of the best trees rather than evenly space trees in the stand and should be varied with slope position so that generally, higher basal areas are retained on lower slope positions. Basal area from gaps and dense patches should be averaged to achieve target objectives across the stands.
2. Sugar pine should be retained as much as possible during any thinning operation in order to preserve genetic diversity, especially white pine blister rust resistant individuals. An exception to this would be thinning suppressed conifers or hardwoods within pure sugar pine groups to reduce inter-tree competition.

Merchantable Sawlog-sized trees

1. *Cut tree mark* variable density thin in the matrix. Sawlog diameter limits for thinning range from 10.0” to 29.9” DBH;

PRESCRIPTION #1 continued

2 Remove in this order; white fir, incense cedar, red fir, and pines in the over topped and intermediate crown position that are less than 29.9 inches DBH except where they are providing for unique wildlife use characteristics or if they are connected at the base or white fir likely root graphed to a codominant or dominate tree of the same species that is being retained;

3 Remove white fir and incense cedar in the codominant or in some cases dominate crown position that are less than 29.9 inches in diameter and Jeffrey or ponderosa pine less than 24 inches diameter in the codominant crown position with:

   a. Remove unhealthy trees when the crown is characterized by needles that are shorter and chlorotic compared to neighboring trees and/or low live crown ratios (<30%);

4 Retain wildlife trees with dead, broken, forked tops or obvious sign of use. Retain small clumps when possible for future snag recruitment.

5 Remove white fir and incense cedar in the codominant or in some cases dominate crown position that are less than 29.9 inches in diameter in the codominant crown position, except where identified for wildlife use clumps that are:

   a. Within the dripline of healthy, California black oak, or ponderosa, Jeffrey or sugar pine, or likely to grow into the dripline of in the next 20 years;

   b. Shading or inhibiting regeneration of sugar, Jeffrey, or ponderosa pine in a favorable microsite for regeneration with an available seed source;

   c. Remove shade tolerant conifers (i.e., white fir, red fir, incense cedar) that have interlocking crowns;

   d. Retain healthy codominant and dominant shade-intolerant conifers (sugar pine, ponderosa, and Jeffery pine) in clumps around the legacy trees;

6 Where homogenous stands of white fir exist in the vicinity of larger pines and are experiencing annosus root rot as indicated by dead and dying white fir in the areas, create .025 to 1 acre openings, removing all of the white fir in the area less than 29.9 inches diameter; and

7 Locate gaps where there are few to no trees over 30 inches.

Retention Areas: These areas are located within control areas and riparian conservation areas (RCAs) where no trees are harvested.

Sub-merchantable biomass trees: Sub-merchantable material may be treated by biomass or follow up hand cut pile and burn, hand cut grapple pile and burn, mastication, or underburning treatments.

Snags

1. Leave 4 - 6 large snags (>15" DBH and ≥ 20 feet tall) per acre where available and where safety provides. Snag retention levels would be evaluated on a 10 acre basis and should be clumped and irregularly distributed across the unit; and
2. Where snags are not present, retain at least 2 of the largest green trees per acre (where available and averaged on a 10 acre basis) for snag recruitment: for wildlife favor retaining green trees with dead and decayed parts or deformed tree with limb deformities for snag retention.

PRESCRIPTION #1 continued

CONSTRAINTS

1. Perimeter Roadways in Retention and Partial Retention Zones: Mark only cut trees and on the unseen side of the tree;
2. Minimize logging damage to residual trees and boundary trees;
3. Mechanical equipment operation is limited to 35% slope; allowing for 100 foot pitches of more than 35 percent slope.
4. Apply a **25-foot** equipment exclusion zone buffer for ephemeral streams;
5. Apply an **82-foot** equipment exclusion zone buffer for all intermittent streams; and
6. Apply a **100-foot** buffer on all perennial streams.
7. No more than 30% canopy reduction from existing condition, averaged per unit.

ADDITIONAL TREATMENTS

1. Units will be whole-tree removal and tractor logged on slopes less than 35 percent and lop/scat on isolated hazard trees on very steep slopes;
2. Follow-up may include underburning after treatment to reduce slash, naturally occurring surface fuels and residual ladder fuels. Piling activity slash and burning piles may occur before the underburn if post-thinning slash levels would not allow fuels officers to meet prescribed fire objectives; and
3. Apply a registered borate compound to all freshly cut conifer stumps >14 inches dbh to reduce the chance of creating new infection centers of *Heterobasidion irregular* and *H. occidentale* within the unit.

2) PRESCRIPTION FOR HAZARD TREE REMOVAL

UNITS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

OBJECTIVES AND DESIRED CONDITIONS

1. Reduce the number and severity of accidents and decrease the potential for accidents on National Forest Systems roads and designated routes by removing hazardous trees that could fall on onto Forest system roads and/or facilities that could cause personal injury and/or property damage to the general public, contractors, and Forest Service employees;
2. Ensure public safety and forest resource values are protected; and
3. Within spotted owl protected activity centers, where treatment is necessary, remove only material needed to meet project Hazard objectives. Only remove trees with serious defects or if the tree is dead or dying. Reference the Hazard tree Removal Guidelines for Forest Service facilities and roads in the pacific Southwest region (Report # RO-12-01) to accurately diagnose high failure trees. Hazard trees in PACs found along paved main roads can be removed when of low, moderate, to high failure (e.g. may fall immediately or within 3 years). On dirt roads less traveled, removal of hazard trees would be of a Rating 4 total failure potential score is the highest observed defect value (Hazard Tree Guidelines Forest Service 2012)

AREA OF TREATMENT WITHIN UNIT

Hazard tree removal will occur throughout the sale area boundary as needed.

PRESCRIPTION #2 - Hazard Tree Removal

Merchantable sawlog-sized trees

1. Hazard tree removal would include dead or dying trees, dead parts (i.e., dead tops or limbs) of live trees, or unstable live trees that are likely to fail in the near future and are within the striking distance of people, facilities, or roads;
2. Hazard tree marking guidelines would follow the "Hazard Tree Guidelines for Forest Service, Facilities and Roads in the Pacific Southwest" (Forest Health Protection, Pacific Southwest Region, Report #RO-12-01, April 2012); and

PRESCRIPTION #2 continued

3. *Cut tree mark* hazard trees. No sawlog diameter limits for hazard tree removal.

Sub-merchantable biomass trees

1. Sub-merchantable material may be treated by follow up mastication, biomass removal, hand cut, hand pile and burn; hand cut, grapple pile, and burn; or underburning treatments;
2. Treat trees up to 9.9" DBH at a spacing of 18-24 feet apart, except where holes would be created in canopy cover. Treat trees that contribute to ladder fuels and are directly underneath the drip line of an overstory leave tree;
3. Retain sub-merchantable trees in openings or gaps in the overstory. In these areas, space residual trees or tree clumps approximately 18-24 feet apart; and
4. Remove brush and small dead or dying trees <9.9" DBH.

Snags: Not applicable within striking distance of roads and/or facilities that could cause personal injury and/or property damage.

CONSTRAINTS

1. Roadways in Retention and Partial Retention Zones: Mark only cut trees and on the unseen side of the tree for visual quality objectives;
2. Roadside stumps that are visible within 50 feet of Valley Creek Special interest area should be cut to within eight inches of the ground (or as low as possible considering obstacles and safety) and the cut should slope away from travel way;
3. Minimize logging damage to residual trees and boundary trees;
4. Mechanical equipment operation is limited to 35% slope; allowing for 100 foot pitches of more than 35 percent slope.
5. Limit ground-based equipment to slopes less than 25% within all Riparian Conservation Areas (RCAs);
6. Establish a **100-foot** "equipment exclusion zone" along each side of perennial streams and special aquatic features, **82-foot** "equipment exclusion zone" along each side of intermittent and **25-foot** "equipment exclusion zone" along each side ephemeral streams. No harvest or ground based equipment is allowed in equipment exclusion zones unless agreed to by the District Hydrologist;
7. For the California spotted owl and Northern goshawk PACs: Maintain a limited operating period (LOP), prohibiting vegetation treatments within approximately ¼ mile of the activity

center during the breeding season (March 1 through August 15), unless surveys confirm that California spotted owls are not nesting; and

8. For California spotted owl PACs and Goshawk PACs: hazard tree removal will be restricted to failure potential 4 (tree is dead) and 3 (high potential for failure) within the potential failure zone of the road.

ADDITIONAL TREATMENTS

1. Units will be whole-tree removal and tractor logged on slopes no more than 35 percent;
2. Hand cut the ladder fuels. Hand pile the activity slash;
3. Follow-up treatments would include underburning after treatment to reduce slash, naturally occurring surface fuels and residual ladder fuels. Piling activity slash and burning piles may occur before the underburn if post-thinning slash levels would not allow fuels officers to meet prescribed fire objectives; and pile slash away from riparian areas approximately 25 feet away from the stream bank.

PRESCRIPTION #2 continued

4. Apply a registered borate compound to all freshly cut conifer stumps >14 inches dbh to reduce the chance of creating new infection centers of *Heterobasidion irregular* and *H. occidentale* within the unit.

3) WILDLIFE PRESCRIPTION

UNITS: 4, 5, 6, 10, 11, 12, 13,

OBJECTIVES AND DESIRED CONDITIONS

1. Retain species diversity with emphasis on oak restoration opportunities.
2. Reduce the risk of insect and disease-caused tree mortality through mechanical thinning;
3. White fir will be removed in favor of retaining other tree species;
4. Promote shade intolerant oak species and pine; and
5. Improved health of retained trees;
6. Retain a minimum of 40% canopy cover where necessary to promote oak along the road and greater than 55% canopy the further from the road and near drainages.
7. Surface fuels able to carry no more than 4 feet flame length surface fires (90th percentile weather conditions); fuel loading of fuels less than 3 inch diameter not exceeding 5 tons per acre;
8. Reduce stand basal area keeping the older cohort stand density, while retaining mature and younger oaks for recruitment.
9. Conifers are natural associates with in oak woodlands, leave codominant trees around oaks, favoring ponderosa pin and sugar pine.
10. Maintain wildlife use characteristics; and
11. Focus oak release near roads and in already open areas, such as open slopes to encourage future acorn gathering groves. Avoid removing dense closed canopy in areas away from the road. Especially if oak is not predominate.

12. Promote Oaks and Pine to support a variety of game species, including deer, black bear, squirrels, woodpeckers, and band-tailed pigeon.
13. Promote Oaks and Pine to support a variety of game species, including deer, black bear, squirrels, woodpeckers, and band-tailed pigeon.
14. Target Restoration near roads and on gentle more open slopes to encourage future acorn gathering groves, and avoid steeper, dense closed canopy stands away from roads in order not to conflict with wildlife (FS sensitive species) that depend on such habitat.
15. Create gaps around mature oaks to encourage both acorn production and recruitment of young trees that will have the opportunity to establish.

16. Develop older forest conditions by releasing trees capable of large diameter growth.

AREA OF TREATMENT WITHIN UNIT

a. Use large dominant or codominant trees with desirable wildlife characteristics such as forks, multiple tops, broken tops, bayonet tops, crooks, existing cavities, large basal scars, and/or evidence of rot to meet these objectives;

b. Trees greater than 30 inches DBH could be used to fulfill these retention levels where appropriate wildlife structures are present.

Units 4, 5, 6 and 12 Retain a minimum of 40% canopy cover where necessary to promote oak along the road and greater than 55% canopy the further from the road and near drainages.

c.

In specified units: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

Units identified as oak release:

1. Units 4, 5, 6 and 12 Retain a minimum of 40% canopy cover where necessary to promote oak along the road and greater than 55% canopy the further from the road and near
2. Remove overtopping conifers, specifically on southern, south-east and south-west aspects; and
   a. Retain codominant and dominant shade intolerant conifers on northern aspects;
3. Where feasible and available, leave all black oaks to provide future recruitment of black oaks that is necessary to achieve 25-35 square feet of basal area per acre within the matrix.

Identified high quality owl habitat within commercial thin areas: The objective is to preserve higher canopy cover and provide adequate vertical and horizontal structure for perch and pounce hunting, predator avoidance, and prey species abundance in the higher quality goshawk habitat to minimize impacts while improving resilience to disturbance across units and the landscape. Field verify and identify retention areas 0.25 acres or larger.

1. If tree clumps and structures important are present then structures should be retained. Structure includes tall trees, trees > 30" dbh, multiple canopy layers, downed logs, snags, and other wildlife use structures;
2. Areas with greater than 48 meter tall trees identified by LIDAR are highest priority for retention where structures important to owl exist;
3. Where areas of greater than 48 meter tall trees are not identified for retention, greater than 32 meter tall habitat should also be evaluated and if habitat elements exist in these areas then 0.25 acre or greater retention pockets should be placed in these areas;

4. There is not a minimum or maximum retention acreage required, but rather a need to identify areas where the higher quality foraging habitat conditions exists and retain key structures. Wildlife experts should be consulted during this effort to make sure that the right structures are being retained.

PRESCRIPTION #3

Stand-wide

1. Retain trees all live trees >30" DBH, except for operability; and
2. Species preference for the residual trees are shade intolerant species where they exist. Preference order is: Black Oak, sugar pine, ponderosa pine, Jeffrey pine, Douglas-fir, black oak, incense-cedar and true fir. Retain healthy sugar pine >9.9" DBH (>40% crown, not suppressed) that are visibly free of white pine blister rust where possible.
2. **Merchantable Sawlog-sized trees:** *Cut tree mark* in the matrix. Sawlog diameter limits for thinning range from 10.0" to 29.9" DBH;

Sub-merchantable biomass trees

1. *Masticate* trees up to 9.9" DBH at a spacing of 18-24 feet apart, except where holes would be created in canopy cover. Masticate trees that contribute to ladder fuels and are directly underneath the drip line of an overstory leave tree;

PRESCRIPTION #3 continued

2. Target white fir, incense cedar;
3. Retain sub-merchantable trees in openings or gaps in the overstory. In these areas space residual trees or tree clumps approximately 18-24 feet apart; and
4. Masticate all brush and small dead or dying trees <9.9" DBH.

CONSTRAINTS

1. No mastication equipment would enter botanical or archeological control areas;
2. Limiting operating period (LOP) March 1- August 15 for all units (**4, 5, 6, and 13)** in this PAC.
3. Mastication would not occur on slopes greater than **45%**;
4. Apply a **25-foot** equipment exclusion zone buffer for ephemeral streams without annual scour;
5. •Apply an **82-foot** equipment exclusion zone buffer for all ephemeral streams with annual scour, and intermittent, and perennial streams that don't have fish; and
6. Apply a **100-foot** equipment exclusion zone buffer on all intermittent and perennial streams that have fish.
7. In CSO HRCA, do not reduce canopy below 50% averaged across stand.

ADDITIONAL TREATMENTS

1. Follow-up treatments after mastication may involve prescribed fire (hand cutting and piling, pile burning, or underburning) to reduce surface fuels, residual ladder fuels and sprouting vegetation; and
2. The areas available for mastication would be masticated first and the entire unit, including RCAs and areas with >45% slope would be underburned later.

APPENDIX A. FIGURES

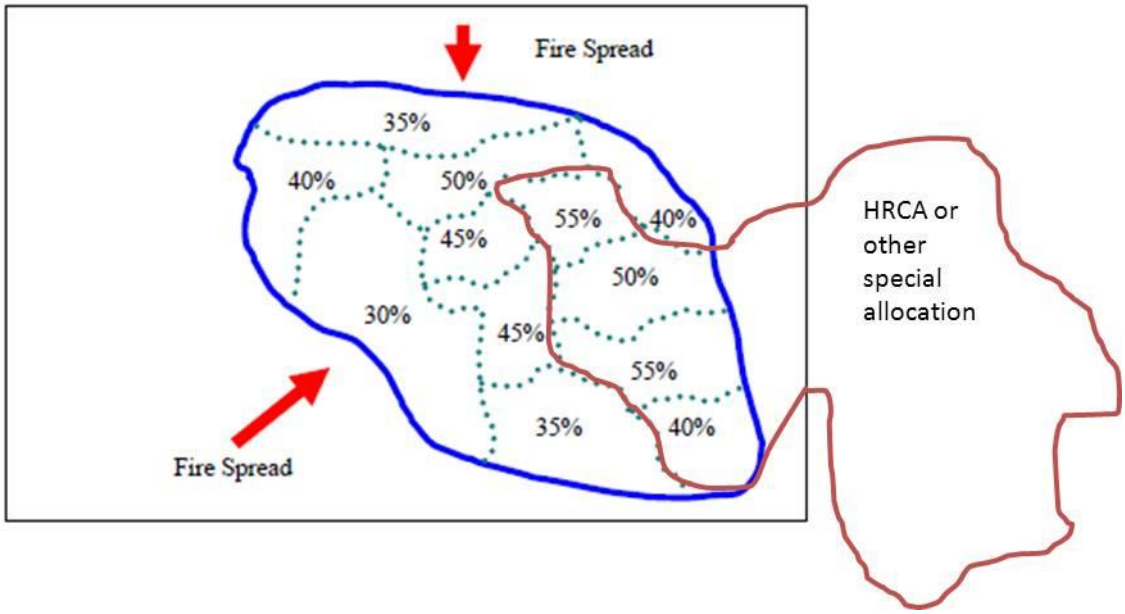


Figure 1. Averaging canopy cover within a treatment unit that is within a spotted owl home range core area (HRCA) and outside the HRCA. The averaged canopy cover for the treated HRCA meets 50 percent. The averaged canopy cover for outside the HRCA meets 40 percent.

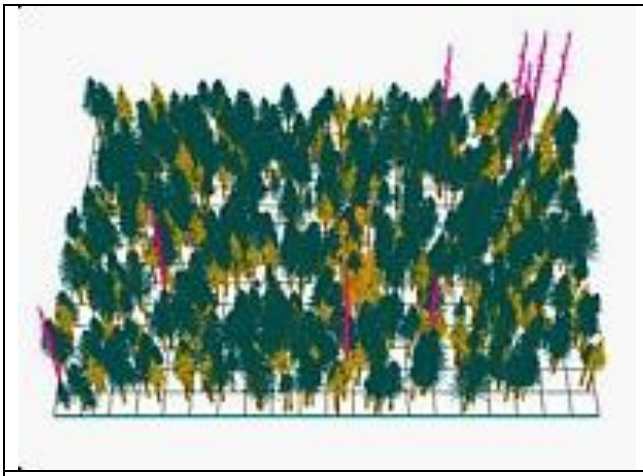


Figure 2. Pre-treatment thinning

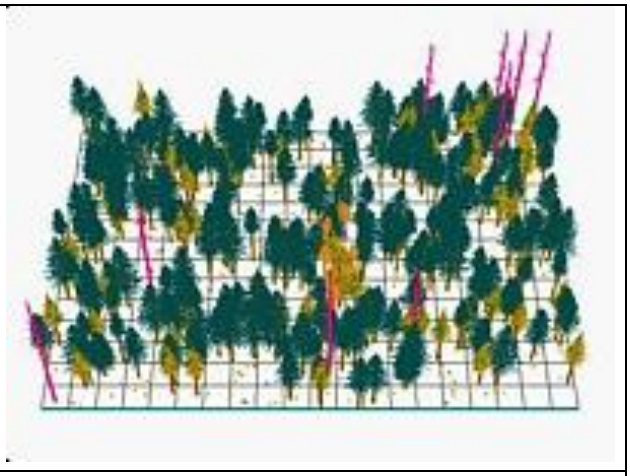
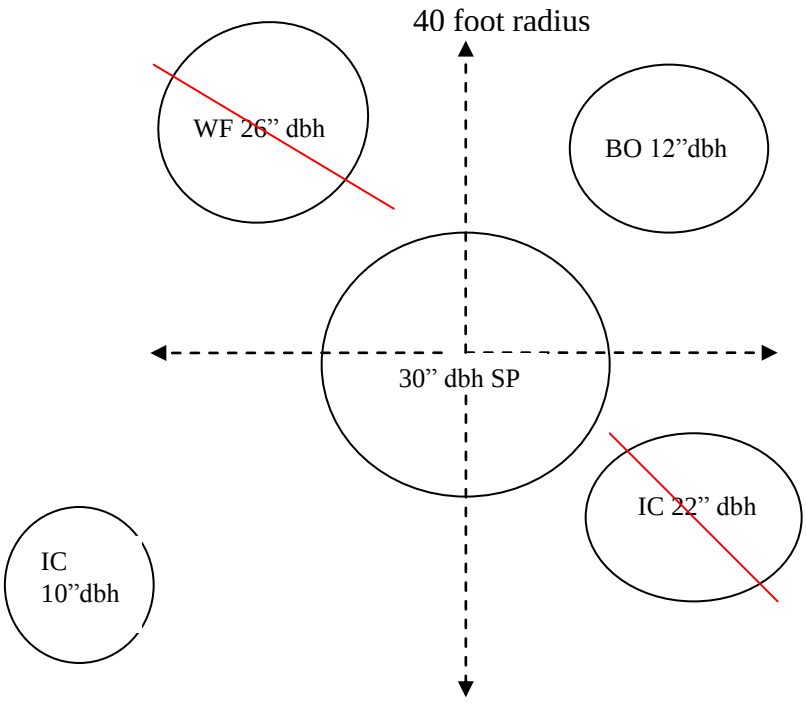


Figure 3. Post-treatment thinning (gaps & clumps)

Schematic for radial release (DBH" + 10 Feet) = Radius



30" DBH + 10 feet = 40 foot radius

- Radial release corresponds to tree DBH" + 10 feet up to a maximum of 40 feet.
- Oaks greater than 9 inches dbh would be retained
- Remove shade tolerant conifers (i.e., white fir, red fir, incense cedar) that have interlocking crowns.
- Retain healthy codominant and dominant shade-intolerant conifers (sugar pine, ponderosa, and Jeffery pine) in clumps around the legacy trees.
- For black oaks, remove overtopping conifers, specifically on southern, south-east and south-west aspects.

- ***Need to specify: In units 4, 5, 6, and 12 retain trees that have been codominant and have protected the oak i.e. wind and snow during its life.***